Digi 4 Plus

Quick Reference Guide

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DIGI 4 PLUS QUICK REFERENCE

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INTRODUCTION

The Digi 4 Plus Quick Reference is a concise guide for programming the Digi 4 Plus. It is intended for users who are familiar with the system and system documentation. However, it also gives inexperienced users an overview of Digi 4 Plus operation.

This guide contains eight sections:

Section 1 describes the operator panel.
Section 2 describes channel and and calculation (CALC) channel assignments.
Section 3 describes functions and includes a functions table.
Section 4 describes sources and includes a sources table.
Section 5 describes limits and limit op-codes and includes a limit op-codes table.
Section 6 describes configuration codes and includes a configuration codes table.
Section 7 describes messages and labels and includes a text addresses table.
Section 8 describes reports and includes instructions for setting up a trend report.

It also contains four appendixes that provide pertinent non-programming information:

Appendix A describes DIP switch settings and includes baud rate and unit identifier tables.
Appendix B describes passwords.
Appendix C describes system defaults.
Appendix D describes program listings.

Each section references the applicable section of the Digi 4 Plus Monitor/Control System User's Manual. For detailed information on related areas, see A Description of the Digi 4 Sequencer (sequencer), Digi 4 PID Control Functions (PID), Auto-Trend Manual (Auto-trend), KVIEW User's Guide and Mini-KVIEW User's Guide (Kaye workstation software).

OPERATOR PANEL

The Digi 4 Plus operator panel has 39 pressure-sensitive keys, 3 LED displays and 7 status indicator lights. The keys let you define parameters, perform an operation, or view data.

KEYS

The following keys complete channel and CALC channel assignments:

Key	Purpose
CHANNEL	Access a channel address 101-816 or a CALC channel address 001-09 To access a channel: - Press the CHANNEL key. - Key in the address.
FUNCTION	Designate specific computational routine performed at a channel or CALC channel (Described in Function Section)
SOURCE	Specify address of input data (Described in Sources Section)
INPUT	Store user-defined values or reflect current source data values To assign Input 1: - Key in the channel address. - Press the INPUT key. (If there are 5 dashes in the center of the display, you cannot assign a value.) - Key in the value for Input 1. To assign Input 2: - Press the INPUT key again. - Key in the value for Input 2. - Press the ENTER key.

Key	Purpose
OUTPUT	Store user-defined values To assign Output 1: - Press the OUTPUT key. (If there are 5 dashes in the center of the display, you cannot assign a value.) - Key in the value for Output 1. - Press the ENTER key. To assign Output 2: - Press the OUTPUT key again. - Key in the value for Output 2. - Press the ENTER key.
UNITS	Designate engineering units To assign units: - Key in the channel or CALC channel address. - Press the UNITS key. - Press the ALPHA SHIFT key. - Key in the identifying letter. - Press the ENTER key.

The following keys are used to complete assignments at channels 101-816. They are not used with CALC channels.

Key	Purpose
LIMIT	Specify limit value (Described in Limits Section)
LIMIT TYPE	Specify type of limit (Described in Limits Section)
LIMIT OP-CODE	Specify limit action (Described in Limits section)

The following keys define system timers and historical buffers, and assign alphanumeric data to text addresses.

Key	Purpose
TIMER	Control logic bit that is momentarily set to true following timer reset (Assign the time interval to input, the reset time to output.) To assign a time interval: - Press the TIMER key. - Key in the address. - Press the ENTER key. - Press the INPUT key. - Assign or update the timer interval. (The 8-digit display represents the number of days, hours, minutes, and tens of seconds between resets. - Press the ENTER key. To assign a reset time: - Press the OUTPUT key. - Assign or update the reset time. (The 8-digit display represents the day, hour, minute, and tens of seconds when the timer restarts.) - Press the ENTER key.
BUFFER	Store data temporarily on FIFO basis in an historical buffer To assign data to an historical buffer: - Press the BUFFER key. - Key in the buffer address. - Press the SOURCE key. - Key in the input data address. - Press the ENTER key. To specify the logic bit that controls the interval between samples: - Press the SOURCE key again. - Key in the logic address. - Press the ENTER key.
TEXT	Create and assign text (Described in Messages and Label section)
ALPHA SHIFT	Enable or disable alpha shift (Used to access characters in upper right corner of keys for messages, labels and units)

The CONSTANT key is used only with multi-segment input, multi-segment transfer, and polynomial transfer functions. It stores two user-defined, 5-digit values.

To assign an input constant:
- Press the CONSTANT key.
- Key in the constant address.
- Press the ENTER key.
- Press the INPUT key.
- Key in the value.
- Press the ENTER key.

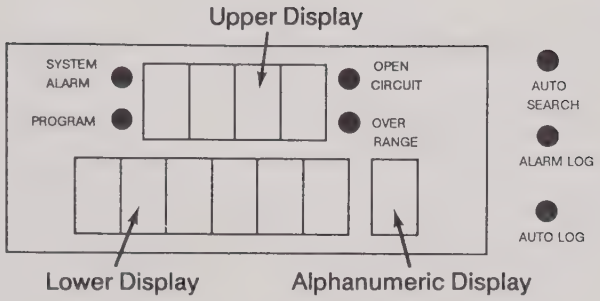
To assign an output constant:
- Press the OUTPUT key.
- Key in the value.
- Press the ENTER key.

The following keys perform an operation:

Key	Purpose
TIME	Display current date and time (Must be in program mode to set system clock)
ENTER	Enter or update parameter values
CONFIG CODE	Define operation of Digi 4 Plus (Described in Configuration Code Section)
PROGRAM	Enter or leave program mode
→	Access next higher address
←	Access next lower address
ADVANCE	Access next higher address and carry forward last valid entry (Press the ADVANCE and ENTER keys to copy data from one parameter to another.)

Key	Purpose
RESTORE	Restore original data (Use only if you have not pressed the ENTER key.)
LOG	Generate a report if specified in configuration code (Press twice rapidly to enable or disable AUTO LOG.)
ALARM LOG	Generate a report if specified in conconfiguration code (Press twice rapidly to enable or disable ALARM LOG.)
ALARM SEARCH	Generate automatic search for tripped channels (Press twice rapidly to enable or disable AUTO SEARCH.)
LIST PROGRAM	List values assigned to channel, CALC channel, and system parameters
NULL	Delete unwanted entries (Use with the ENTER key.)

LED DISPLAYS



Display	Purpose	Display	Purpose
Upper	Provide addresses	Alpha-numeric	Show a single character that can identify units and accessed parameters or form part of a message or label
Lower	Provide data or indicate address		

STATUS INDICATORS

Light	Purpose	Light	Purpose
SYSTEM ALARM	Indicate an alarm at one or more channels	AUTO SEARCH	Indicate system is searching for channels in alarm and displaying each at 1 second intervals
PROGRAM	Indicate Digi 4 Plus is in program mode	ALARM LOG	Indicate you have enabled ALARM LOG to generate reports per configuration code
OPEN CIRCUIT	Indicate channel is not receiving data because of open sensor wire or 000 function code	AUTO LOG	Indicate you have enabled AUTO LOG to generate reports per configuration code(s)
OVER RANGE	Indicate channel output data does not fit ±65535 display capacity		

See Section 3 of the Digi 4 Plus Monitor/Control System User's Manual for detailed information on the operator panel.

CHANNEL ASSIGNMENTS

You program all information into fixed format locations called channels. The function code specifies the exact operation the Digi 4 Plus performs, and determines which additional parameters you use. Other parameters specify the resolution of output data (decimal code), sources, data storage areas (inputs and outputs), and units.

You can assign limits and their controls (limit op-codes) to channels 101-816 but not to the CALC channels 001-099. The CALC channels do not accept functions that require live input, output logical data, or print one-line messages. You cannot include the CALC channels in a report.

Figure 1 shows the parameters you can assign to channel addresses 101-816, and Figure 2 shows the parameters you can assign to CALC channels 001-099.

FUNCTION CODE	Decimal Code
Source 1	Source 2
Input 1	Input 2
Output 1	Output 2
Limit 1	Limit 2
High Low Change	High Low
Op-Codes 1, 2, 3	Op-Codes 1, 2, 3
OUTPUT DATA	Units

Figure 1. Digi 4 Plus Channel Parameters

FUNCTION CODE	Decimal Code
Source 1	Source 2
Input 1	Input 2
Output 1	Output 2
OUTPUT DATA	Units

Figure 2. Digi 4 Plus Parameters, CALC channels 001-099.

See Section 4 of the Digi 4 Plus Monitor/Control System User's Manual for detailed information on channel and constant parameters.

FUNCTIONS

A function is a computational routine that you must assign to each channel or CALC channel you program. A three-digit function code identifies the exact operation that the system performs on input data. You can assign a function code only in the program mode.

Functions vary among the 3 versions of the Digi 4 Plus. The 4S Plus supports measurement and analysis (Functions 1-133), the 4M Plus adds application-specific functions (160-195), and the 4C Plus adds control capability (Functions 140-150). Any function code that requires multiple channels must use either channels 101-816 only or CALC channels 001-099 only. The following functions cannot be assigned to CALC channels: 001-050, 056-059, 101-113, 123, and 148-150.

If you change a function code, the Digi 4 Plus nulls all parameters at the channel or CALC channel address, and you must re-enter new ones. If you do not assign a function code at a channel, an open circuit results; if you do not assign a required parameter, an over-range results.

A decimal code defines the resolution of the displayed output data.

To assign a function code:

- Press the PROGRAM key. If necessary, key in your six-digit password.
- Press the ENTER key.
- Key in the channel address.
- Press the FUNCTION key.
- Key in the function code.
- Press the ENTER key.

To assign a decimal code:

- Press the FUNCTION key a second time: the lower display contains zeros and a decimal. (If a minus sign precedes the zeros, you cannot redefine the decimal.)
- Key in zeros with the decimal in the desired position.
- Press the ENTER key.

See Section 5 of the Digi 4 Plus Monitor/Control System User's Manual for detailed information on functions.

Table 1 lists each function and specifies parameters that require a value.

- The System Input column specifies the input voltage range if the function requires system input data.
- The Source 1 and Source 2 columns specify the address of input data. "Displayed" or "Extended" indicates the function requires numerical data. "Logical" indicates the function requires logical input data.
- The Input 1, Input 2, Output 1, and Output 2 columns specify values stored in the four channel registers. "x_1", "x_2", "y_1", "y_2" and "User" indicate you must assign a value.
- The Channel Output Data column specifies the type of data output. "Displayed" indicates the output data must conform to display capacity restraints ($\pm$65535). "Logical" indicates the output data is a logic state (0.0 or 1.0). "Extended" indicates extended precision data in addition to displayed data.
- The Default Decimal Location column specifies the default location of the decimal in displayed data. "(R)" indicates you can redefine the decimal point.
- The Units column specifies the engineering units of output data. "User" indicates you can define the units.

Table 1. Functions

Category	Code	System Input	Description	Source 1	Source 2	Input 1	Input 2	Output 1	Output 2	Output Data Type	Default Decimal Location	Units
SKIP	000	...	Disables channel	...	...	...	...	...	...	...	...	...
+VOLTAGE INPUT												
	001	±60mV	Voltage	...	(Displayed)*	...	...	...	...	Extended	00.000	M
	002	±600mV	Voltage	...	(Displayed)*	...	...	...	...	Extended	000.00	M
	003	±6.0V	Voltage	...	(Displayed)*	...	...	...	...	Extended	0.0000	V
	004	±12V	Voltage	...	(Displayed)*	...	...	...	...	Extended	00.000	V
	005	±30mV	Calibration	...	(Displayed)*	...	...	...	...	Extended	0.0000	...
+LINEAR INPUT												
	006	±60mV	Unbounded	...	(Displayed)*	x_1	x_2	y_1	y_2	Extended	00000.(r)	User
	007	±600mV	Unbounded	...	(Displayed)*	x_1	x_2	y_1	y_2	Extended	00000.(r)	User
	008	±6.0V	Unbounded	...	(Displayed)*	x_1	x_2	y_1	y_2	Extended	00000.(r)	User
	009	±12V	Unbounded	...	(Displayed)*	x_1	x_2	y_1	y_2	Extended	00000.(r)	User
	010	±60mV	Bounded	...	(Displayed)*	x_1	x_2	y_1	y_2	Extended	00000.(r)	User
	011	±600mV	Bounded	...	(Displayed)*	x_1	x_2	y_1	y_2	Extended	00000.(r)	User
	012	±6.0V	Bounded	...	(Displayed)*	x_1	x_2	y_1	y_2	Extended	00000.(r)	User
	013	±12V	Bounded	...	(Displayed)*	x_1	x_2	y_1	y_2	Extended	00000.(r)	User
	014	±60mV	Clamped	...	(Displayed)*	x_1	x_2	y_1	y_2	Extended	00000.(r)	User
	015	±600mV	Clamped	...	(Displayed)*	x_1	x_2	y_1	y_2	Extended	00000.(r)	User
	016	±6.0V	Clamped	...	(Displayed)*	x_1	x_2	y_1	y_2	Extended	00000.(r)	User
	017	±12V	Clamped	...	(Displayed)*	x_1	x_2	y_1	y_2	Extended	00000.(r)	User
+THERMOCOUPLE												
	018	±30mV	B (0.1F)	000**	(Displayed)*	***	***	***	***	Extended	0000.0	F
	019	±30mV	B (0.1C)	000**	(Displayed)*	***	***	***	***	Extended	0000.0	C

(x_1,y_1) and (x_2,y_2) are two known input/output points.

* Source 2 is the address of the filter time constant in seconds.

** When Source 1 equals 000, use the built-in thermocouple reference. If you assign a non-zero address to Source 1, that address should contain the compensation voltage value for the thermocouple.

*** Use (x_1,y_1) and (x_2,y_2) to linearize the input. You must perform linearization before you apply AUTOCAL to the function. You can apply AUTOCAL to Function Codes 006 to 054.

\+ Functions in this group cannot be assigned to CALC channel addresses 001-099.

Category	Code	System Input	Description	Source 1	Source 2	Input 1	Input 2	Output 1	Output 2	Output Data Type	Default Decimal Location	Units
+THERMOCOUPLE (cont.)												
	020	±60mV	C (0.1F)	000**	(Displayed)*	***	***	***	***	Extended	0000.0	F
	021	±60mV	C (0.1C)	000**	(Displayed)*	***	***	***	***	Extended	0000.0	C
	022	±60mV	E (0.1F)	000**	(Displayed)*	***	***	***	***	Extended	0000.0	F
	023	±60mV	E (0.1C)	000**	(Displayed)*	***	***	***	***	Extended	0000.0	C
	024	±60mV	J (0.1F)	000**	(Displayed)*	***	***	***	***	Extended	0000.0	F
	025	±60mV	J (0.1C)	000**	(Displayed)*	***	***	***	***	Extended	0000.0	C
	026	±60mV	J (0.1C) DIN	000**	(Displayed)*	***	***	***	***	Extended	0000.0	C
	027	±60mV	K (0.1F)	000**	(Displayed)*	***	***	***	***	Extended	0000.0	F
	028	±60mV	K (0.1C)	000**	(Displayed)*	***	***	***	***	Extended	0000.0	C
	029	±60mV	N (0.1F)	000**	(Displayed)*	***	***	***	***	Extended	0000.0	F
	030	±60mV	N (0.1C)	000**	(Displayed)*	***	***	***	***	Extended	0000.0	C
	031	±30mV	R (0.1F)	000**	(Displayed)*	***	***	***	***	Extended	0000.0	F
	032	±30mV	R (0.1C)	000**	(Displayed)*	***	***	***	***	Extended	0000.0	C
	033	±30mV	S (0.1F)	000**	(Displayed)*	***	***	***	***	Extended	0000.0	F
	034	±30mV	S (0.1C)	000**	(Displayed)*	***	***	***	***	Extended	0000.0	C
	035	±30mV	T (0.1F)	000**	(Displayed)*	***	***	***	***	Extended	0000.0	F
	036	±30mV	T (0.1C)	000**	(Displayed)*	***	***	***	***	Extended	0000.0	C
	037	±30mV	T (0.01C)	000**	(Displayed)*	***	***	***	***	Extended	000.00	C
	038	±30mV	T (0.1C) DIN	000**	(Displayed)*	***	***	***	***	Extended	0000.0	C
+RTD	039	±600mV	100ΩPt 3w br 0.1F	...	(Displayed)*	***	***	***	***	Extended	0000.0	F
	040	±600mV	100ΩPt 3w br 0.1C	...	(Displayed)*	***	***	***	***	Extended	0000.0	C
	041	±60mV	100ΩPt 3w br 0.01C	...	(Displayed)*	***	***	***	***	Extended	000.00	C
	042	±600mV	100ΩPt 4w 1ma 0.1F	...	(Displayed)*	***	***	***	***	Extended	0000.0	F
	043	±600mV	100ΩPt 4w 1ma 0.1C	...	(Displayed)*	***	***	***	***	Extended	0000.0	C
	044	±600mV	100ΩPt 4w 1ma 0.01C	...	(Displayed)*	***	***	***	***	Extended	000.00	C
	045	±60mV	10ΩCu 3w br 0.1F	...	(Displayed)*	***	***	***	***	Extended	0000.0	F
	046	±60mV	10ΩCu 3w br 0.1C	...	(Displayed)*	***	***	***	***	Extended	0000.0	C

* Source 2 is the address of the filter time constant in seconds.

** When Source 1 equals 000, use the built-in thermocouple reference. If you assign a non-zero address to Source 1, that address should contain the compensation voltage value for the thermocouple.

*** Use (x_1,y_1) and (x_2,y_2) to linearize the input. You must perform linearization before you apply AUTOCAL to the function. You can apply AUTOCAL to Function Codes 006 to 054.

\+ Functions in this group cannot be assigned to CALC channel addresses 001-099.

Category	Code	System Input	Description	Source 1	Source 2	Input 1	Input 2	Output 1	Output 2	Output Data Type	Default Decimal Location	Units
+MULTI-SEGMENT INPUT												
	047	±60mV	**Bounded**	000	001-099	x_1	x_2	y_1	y_2	Extended	00000.(r)	User
	048	±600mV	**Bounded**	000	001-099	x_1	x_2	y_1	y_2	Extended	00000.(r)	User
	049	±6.0V	**Bounded**	000	001-099	x_1	x_2	y_1	y_2	Extended	00000.(r)	User
	050	±12V	**Bounded**	000	001-099	x_1	x_2	y_1	y_2	Extended	00000.(r)	User
	When Source 1 is 000, use the system input voltage. When Source 1 is a channel address, the system subtracts the value at that address from the system input voltage. Source 2 is the constant address of the first defined point.					Use (x_1, y_1) and (x_2, y_2) to linearize the input. You must linearize before applying Autocal. Functions 006 to 054 support Autocal.						
LINEAR TRANSFER												
	051	...	**Unbounded**	(Extended)	(Displayed)	x_1	x_2	y_1	y_2	Extended	00000.(r)	User
	052	...	**Bounded**	(Extended)	(Displayed)	x_1	x_2	y_1	y_2	Extended	00000.(r)	User
	053	...	**Clamped**	(Extended)	(Displayed)	x_1	x_2	y_1	y_2	Extended	00000.(r)	User
	Source 1 is the channel address of the input data. Source 2 is the address of the filter time constant in seconds.					(x_1, y_1) and (x_2, y_2) are two known input/output points.						
MULTI-SEGMENT TRANSFER												
	054	...	**Bounded**	(Displayed)	001-099	x_1	x_2	y_1	y_2	Extended	00000.(r)	User
	Source 1 is the channel address of the input data. Source 2 is the constant address of the first defined point.					Use (x_1, y_1) and (x_2, y_2) to linearize the input. You must linearize before applying Autocal. Functions 006 to 054 support Autocal.						
DATA ACCUMULATION												
	055	...	**Displays total**	(Displayed)	(Logical)	x_1	x_2	y_1	user	Displayed	00000.(r)	User
	+056	...	**Prints total**	(Displayed)	(Logical)	x_1	x_2	y_1	user	Displayed	00000.(r)	User
	+057	...	**Transmits total**	(Displayed)	(Logical)	x_1	x_2	y_1	user	Displayed	00000.(r)	User
	+058	...	**Prints and transmits**	(Displayed)	(Logical)	x_1	x_2	y_1	user	Displayed	00000.(r)	User
	Source 1 is the channel address of the input data. Source 2 is a logic address whose logic bit controls the accumulation interval. A FALSE/TRUE transition resets the total. x_1, x_2 and y_1 define the scale factor.					Output 2 > 0: Accumulate every math scan; clear to 0 at reset. Output 2 = 0: Accumulate every 10 sec; clear to 0 at reset (default). Output 2 = -0: Accumulate every 10 sec; displayed total subtracted from accumulation register at reset. Output 2 < -0: Accumulate every math scan; displayed total subtracted from accumulation register at reset.						

+ Functions in this group cannot be assigned to CALC channel addresses 001-099.

Category	Code	System Input	Description	Source 1	Source 2	Input 1	Input 2	Output 1	Output 2	Output Data Type	Default Decimal Location	Units
METER	+059	...	**8 digit total**	(Displayed)	(Logical)	...	...	User	User	Displayed 00000.(r)	000.00	User

Assigning Function 059 to a channel automatically assigns Function 211 to the next higher channel. Source 1 is the channel address of the input data. Source 2 is the address of the logic bit whose FALSE/TRUE transition resets the meter to zero.

Output 1 is the maximum count value of the data at the Function 059 channel. The default is 9999. Output 2 is the time base in minutes of the totaled data. If undefined, it defaults to per minute. Decimal location at Function 059 channel is 000.00. Decimal location at Function 211 channel is 00000 (r).

COUNTER												
	060	...	**Counts logic bits**	(Logical)	(Logical)	...	...	...	...	Displayed	00000	User

Source 1 is the address of the logic bit to be totaled.
Source 2 is the address of the logic bit whose FALSE/TRUE transition resets the counter to zero.
The reset logic bit has priority.

INTERVAL												
	061	...	**Average**	(Displayed)	(Logical)	...	...	...	...	Extended	00000.(r)	User
	062	...	**Maximum**	(Displayed)	(Logical)	...	...	...	...	Displayed	00000.(r)	User
	063	...	**Minimum**	(Displayed)	(Logical)	...	...	...	...	Displayed	00000.(r)	User
	064	...	**Rate of change**	(Displayed)	(Displayed)	...	...	User	...	Extended	00000.(r)	User

Source 1 is the channel address of the input data.
Source 2 for Functions 061-063 is a logic address, usually a system timer, whose logic bit controls the time interval. A FALSE/TRUE transition starts a new interval.
Source 2 for Function 064 is the address of the filter time constant in seconds.

Output 1 is the unit of measurement in seconds. If undefined, it defaults to rate of change per second.

ELAPSED TIMER												
	065	...	**Run=1 Reset=0/1**	(Logical)	(Logical)	...	...	User	...	Displayed	00000.(r)	User
	066	...	**Run=0 Reset=0/1**	(Logical)	(Logical)	...	...	User	...	Displayed	00000.(r)	User

Source 1 is a logic address whose logic bit controls the run of the elapsed timer.
Source 2 is a logic address whose logic bit controls the reset of the elapsed timer with a FALSE/TRUE transition.
The reset logic bit has priority over the run logic bit.

Output 1 is the time scaling factor. The default is seconds.
To change the time base, set Output 1 equal to the number of seconds in the new time base.

*** Use (x_1,y_1) and (x_2,y_2) to linearize the input. You must linearize before applying Autocal. Function Codes 006 to 054 support Autocal.
+ These functions cannot be assigned to CALC channel addresses 001-099.

Category	Code	System Input	Description	Source 1	Source 2	Input 1	Input 2	Output 1	Output 2	Output Data Type	Default Decimal Location	Units
HISTORICAL BUFFER												
	067	...	**Average**	001-016	001-032	...	...	...	...	Extended	00000.(r)	User
	068	...	**Maximum**	001-016	001-032	...	...	...	...	Displayed	00000.(r)	User
	069	...	**Minimum**	001-016	001-032	...	...	...	...	Displayed	00000.(r)	User
	070	...	**Selects nth sample**	001-016	001-032	...	...	...	...	Displayed	00000.(r)	User
	071	...	**Selects 4 highest**	001-016	001-032	...	...	...	...	Displayed	00000.(r)	User
	072	...	**Sum**	001-016	001-032	...	...	...	...	Extended	00000.(r)	User
	073	...	**Standard deviation**	001-016	001-032	...	...	...	...	Extended	00000.(r)	User
			Source 1 is the address of the historical buffer that contains the samples. Source 2 is the number of samples. Each historical buffer has two sources: Source 1 is the channel address of the input data; Source 2 is a logic address, usually a system timer, whose logic bit controls the interval between each new sample.									
	074	...	**Clears the buffer**	001-016	(Logical)	...	...	...	...	Logical	000.00	...
			Source 1 is the address of the historical buffer. Source 2 is the logic address of the controlling logic bit.			The output data reflects the state of the logic bit at the Source 2 address.						
GROUP	075	...	**Average**	(Displayed)	(Displayed)	...	...	...	...	Extended	00000.(r)	User
	076	...	**Maximum**	(Displayed)	(Displayed)	...	...	...	...	Displayed	00000.(r)	User
	077	...	**Minimum**	(Displayed)	(Displayed)	...	...	...	...	Displayed	00000.(r)	User
	078	...	**Selects 4 highest**	(Displayed)	(Displayed)	...	...	...	...	Displayed	00000.(r)	User
	079	...	**Selects 4 highest with addresses**	(Displayed)	(Displayed)	...	...	...	...	Displayed	00000.(r)	User
			You can request channel addresses generating these values.									
	080	...	**Group sum**	(Displayed)	(Displayed)	...	...	...	...	Extended	00000.(r)	User
	081	...	**Standard deviation**	(Displayed)	(Displayed)	...	...	...	...	Extended	00000.(r)	User
			Source 1 is the address of the first channel or CALC channel in the group. Source 2 is the address of the last channel or CALC channel in the group.									

Group functions operate on channels or CALC channels with consecutive addresses. The addresses cannot include both channels 101-816 and CALC channels 001-099. The decimal position must be the same at all channels.

For Function Codes 082 and beyond, if the Input 1 column contains x_1, press the INPUT key once to display numerical input data from Source 1. If Source 1 is 000, the numerical input data can be entered at Input 1. If the Input 2 column contains x_2, press the INPUT key again to display numerical input data from Source 2. If Source 2 is 000, the numerical input data can be entered at Input 2.

Category	Code	System Input	Description	Source 1	Source 2	Input 1	Input 2	Output 1	Output 2	Output Data Type	Default Decimal Location	Units
PAIR	082	...	**Maximum**	(Displayed)	(Displayed)	x_1	x_2	...	...	Displayed	00000.(r)	User
	083	...	**Minimum**	(Displayed)	(Displayed)	x_1	x_2	...	...	Displayed	00000.(r)	User
		Source 1 is the address of the first channel or CALC channel. Source 2 is the address of the second channel or CALC channel. The decimal position must be the same at both channels.										
MATH	084	...	$x_1 + x_2$	(Extended)	(Extended)	x_1	x_2	...	...	Extended	00000.(r)	User
	085	...	$x_1 - x_2$	(Extended)	(Extended)	x_1	x_2	...	...	Extended	00000.(r)	User
	086	...	$x_1 \cdot x_2$	(Extended)	(Extended)	x_1	x_2	...	...	Extended	00000.(r)	User
	087	...	x_1/x_2	(Extended)	(Extended)	x_1	x_2	...	...	Extended	00000.(r)	User
	088	...	$(x_1)^{x_2}$	(Extended)	(Extended)	x_1	x_2	...	...	Extended	00000.(r)	User
	089	...	x_1	(Extended)	...	x_1	...	...	...	Extended	00000.(r)	User
	090	...	log (x_1)	(Extended)	...	x_1	...	...	...	Extended	0.0000(r)	User
	091	...	ln (x_1)	(Extended)	...	x_1	...	...	...	Extended	0.0000(r)	User
	092	...	$e^{(x_1)}$	(Extended)	...	x_1	...	...	...	Extended	00000.(r)	User
	093	...	Sin (x_1)	(Extended)	...	x_1	...	...	...	Extended	0.0000(r)	User
	094	...	Cos (x_1)	(Extended)	...	x_1	...	...	...	Extended	0.0000(r)	User
	095	...	Tan (x_1)	(Extended)	...	x_1	...	...	...	Extended	00.000(r)	User

Category	Code	System Input	Description	Source 1	Source 2	Input 1	Input 2	Output 1	Output 2	Output Data Type	Default Decimal Location	Units
MATH (cont.)												
	096	...	**Arc-Sin (x_1)**	(Extended)	...	x_1	...	...	...	Extended	0.0000(r)	User
	097	...	**Arc-Cos (x_1)**	(Extended)	...	x_1	...	...	...	Extended	0.0000(r)	User
	098	...	**Arc-Tan (x_1)**	(Extended)	...	x_1	...	...	...	Extended	0.0000(r)	User
		Source 1 is the channel or CALC channel address of the x_1 data. Source 2 is the channel or CALC channel address of the x_2 data.										
POLYNOMIAL TRANSFER												
	099	...	**10th order polynomial**	(Extended)	001-099	...	...	...	...	Extended	00000.(r)	User
		Source 1 is the channel address of the input data. Source 2 is the constant address that contains the constant of the zero term.										
OPTIONAL DATA STORAGE												
	100	...	**Group location or min/max time**	...*	...*	...	...	...*	...*	Displayed	...	...
+BOOLEAN												
	101	...	**AND**	(Logical)	(Logical)	...	...	...	...	Logical	000.00	...
	102	...	**MIXED AND**	(Logical)	(Logical)	...	...	...	...	Logical	000.00	...
	103	...	**NOR**	(Logical)	(Logical)	...	...	...	...	Logical	000.00	...
	104	...	**OR**	(Logical)	(Logical)	...	...	...	...	Logical	000.00	...
	105	...	**MIXED OR**	(Logical)	(Logical)	...	...	...	...	Logical	000.00	...
	106	...	**NAND**	(Logical)	(Logical)	...	...	...	...	Logical	000.00	...
	107	...	**XOR**	(Logical)	(Logical)	...	...	...	...	Logical	000.00	...
		Source 1 and Source 2 are logic addresses.										

* Define Source 1, Source 2, Output 1 and Output 2 only for the weighted mixture function (160).
+ Functions in this group cannot be assigned to CALC channel addresses 001-099.

Category	Code	System Input	Description	Source 1	Source 2	Input 1	Input 2	Output 1	Output 2	Output Data Type	Default Decimal Location	Units
+FLIP-FLOPS												
	108	...	**Set=1 Reset=1**	(Logical)	(Logical)	...	...	...	...	Logical	000.00	...
	109	...	**Set=1 Reset=0**	(Logical)	(Logical)	...	...	...	...	Logical	000.00	...
	110	...	**Set=0 Reset=1**	(Logical)	(Logical)	...	...	...	...	Logical	000.00	...
	111	...	**Set=0 Reset=0**	(Logical)	(Logical)	...	...	...	...	Logical	000.00	...
		Source 1 is the logic address of the SET bit. Source 2 is the logic address of the CLEAR bit. The SET bit has priority over the CLEAR bit.										
+DATA COMPARE												
	112	...	**Equal**	(Displayed)	(Displayed)	x_1	x_2	...	...	Logical	000.00	...
		The channel logic bit is TRUE when input data at Source 1 equals input data at Source 2.										
	113	...	**Greater than**	(Displayed)	(Displayed)	x_1	x_2	...	...	Logical	000.00	...
		The channel logic bit is TRUE when input data at Source 1 is greater than input data at Source 2. Source 1 and Source 2 are the channel or CALC channel addresses of the input data.										
DATA TRANSFER												
	114	...	**Transfer on true**	(Extended)	(Logical)	x_1	...	...	...	Extended	00000.(r)	User
	115	...	**Transfer on false**	(Extended)	(Logical)	x_1	...	...	...	Extended	00000.(r)	User
		Source 1 is the channel address of the data to be transferred. Source 2 is the address of the controlling logic bit.										
DATA SELECT												
	116	...	**Select 1 of 2**	(Displayed)	(Logical)	...	...	...	...	Displayed	00000.(r)	User
		Source 1 is the second of two consecutive channel or CALC channel addresses. Source 2 is the logic address of the controlling logic bit. Input data is from Source 1 when the Source 2 logic bit is TRUE. Input data is from the next lower channel or CALC channel address when the Source 2 logic bit is FALSE.										
	117	...	**Select 1 of 2**	(Displayed)	(Logical)	...	...	...	...	Displayed	00000.(r)	User
		Source 1 is the second of two consecutive channel or CALC channel addresses. Source 2 is the logic address of the controlling logic bit. Input data is from Source 1 when the Source 2 logic bit is FALSE. Input data is from the next lower channel or CALC channel address when the Source 2 logic bit is TRUE.										

+ Functions in this group cannot be assigned to CALC channel addresses 001-099.

Category	Code	System Input	Description	Source 1	Source 2	Input 1	Input 2	Output 1	Output 2	Output Data Type	Default Decimal Location	Units
DATA SELECT (cont.)												
	118	...	**Select 1 of 2**	(Displayed)	(Logical)	x_1	...	...	...	Displayed	00000.(r)	User
		Source 1 is a channel or CALC channel address. Source 2 is the logic address of the controlling logic bit. Input data is from Source 1 when the Source 2 logic bit is TRUE. Input data is from the next lower channel address than that assigned Function 118 when the Source 2 logic bit is FALSE.										
	119	...	**Select 1 of 2**	(Displayed)	(Logical)	x_1	...	...	...	Displayed	00000.(r)	User
		Source 1 is a channel or CALC channel address. Source 2 is the logic address of the controlling logic bit. Input data is from Source 1 when the Source 2 logic bit is FALSE. Input data is from the next lower channel address than that assigned Function 119 when the Source 2 logic bit is TRUE.										
	120	...	**Select 1 of 4**	(Logical)	(Logical)	User	User	User	User	Displayed	00000.(r)	User
		Source 1 and Source 2 are logic addresses.				Input 1, Input 2, Output 1, and Output 2 are assigned constants.						
INTEGER ENCODER												
	121	...	**Two bit 0-3**	(Logical)	(Logical)	...	...	...	...	Displayed	00000.	User
		Source 1 and Source 2 are logic addresses.										
	122	...	**Four bit 0-15**	(Logical)	...	...	...	...	...	Displayed	00000.	User
		Source 1 is the first of 4 consecutive logic addresses.										
CONTROL COUNTER												
	+123	...	**Counts to preset value**	(Logical)	(Logical)	...	...	User	...	Logical/ Displayed	00000	User
		Source 1 and Source 2 are logic addresses. The counter increments at a FALSE/TRUE transition of Source 1. It resets when Source 2 is TRUE.				Output 1 is the maximum count value of the control counter. The default is 65,535.						
CONTROL TIMER												
	124	...	**Run=1 Reset=1**	(Logical)	(Logical)	...	...	...	...	Displayed	00000.(r)	User
	125	...	**Run=0 Reset=1**	(Logical)	(Logical)	...	...	User	...	Displayed	00000.(r)	User

+ This function cannot be assigned to CALC channel addresses 001-099.

Category	Code	System Input	Description	Source 1	Source 2	Input 1	Input 2	Output 1	Output 2	Output Data Type	Default Decimal Location	Units
CONTROL TIMER (cont.)												
	126	...	**Run=1 Reset=0**	(Logical)	(Logical)	...	...	User	...	Displayed	00000.(r)	User
	127	...	**Run=0 Reset=0**	(Logical)	(Logical)	...	...	User	...	Displayed	00000.(r)	User
		Source 1 and Source 2 are logic addresses. Source 1 is the run bit and Source 2 is the reset bit.				Output 1 is time scaling factor. The default is seconds. To change the time base, set Output 1 equal to the number of seconds in the new time base.						
INDIRECT TRANSFER												
	128	...	**Select data from multiple addresses**	(Extended)	(Displayed)	...	x_2	...	...	Extended	00000.(r)	User
		Source 1 is the base address. Source 2 is the address of the offset value.										
	129	...	**Transfer/enter data under logical control**	(Extended)	(Logical)	x_1	...	User	User	Displayed	00000.(r)	User
						Outputs 1 and 2 allow manual entries. See Digi 4 Plus User's Guide.						
APPLICATION FIRMWARE												
	130	...	**Relative humidity**	(Extended)	(Extended)	...	x_2	...	...	Extended	0000.0(r)	User
		Source 1 is the channel address that contains the wet bulb temperature. The dry bulb temperature must be at the next channel. Both temperatures must be in C. Source 2 is the atmospheric pressure in atmospheres absolute.										
	131	...	**Cylindrical tank volume**	(Extended)	(Extended)	x_1	x_2	User	User	Extended	00000.(r)	User
		Source 1 is the channel address that contains the value of the hydrostatic head of liquid in the tank. Source 2 is the channel address that contains the value of the liquid density. If undefined, it defaults to one.				Output 1 is the volume of the full tank in the desired units and resolution. If undefined, it defaults to one. Output 2 is the height of the tank, expressed in units consistent with the Source 1 data.						
	132	...	**Spherical tank volume**	(Extended)	(Extended)	x_1	x_2	User	User	Extended	00000.(r)	User
		Source 1 is the channel address that contains the value of the hydrostatic head of liquid in the tank. Source 2 is the channel address that contains the value of the liquid density. If undefined, it defaults to one.				Output 1 is the volume of the full tank in the desired units and resolution. If undefined, it defaults to one. Output 2 is the diameter of the tank, expressed in units consistent with Source 1 data.						

Category	Code	System Input	Description	Source 1	Source 2	Input 1	Input 2	Output 1	Output 2	Output Data Type	Default Decimal Location	Units
APPLICATION FIRMWARE (cont.)												
	133	. . .	**Lethality rate**	(Extended)	(Logical)	x_1	. . .	User	User	Extended	00.000(r)	User
			Source 1 is the channel address that contains the temperature of the product. Source 2 is the logic address of the controlling logic bit. When the logic bit is FALSE, the lethality rate is zero.			Output 1 is the value of Z. Output 2 is the base sterilization temperature.						
CONTROL FIRMWARE												
	134-139	Reserved										
	140	. . .	**Proportional control with external reset**									
	141	. . .	**Proportional control on error squared with external reset**									
			Function 140 (141) channel	PB	PBMR	x_1	x_2	Output clamp low	Output clamp high	MV	00000.(r)	User
			Function 201 channel	CV	SP	x_1	x_2	Input span	High clamp on MR	e_n	00000.(r)	User

a = Derivative filter
CV = Controlled variable
e_n = Loop error
D = Rate gain
FB = Reset feedback
I = Reset time
MR = Manual reset

MV = Manipulated variable
PB = Proportional band
PMV = Preclamp manipulated variable
SP = Setpoint
Y_n = Integral (lag) output
Z_n = Derivative

Category	Code	System Input	Description	Source 1	Source 2	Input 1	Input 2	Output 1	Output 2	Output Data Type	Default Decimal Location	Units
CONTROL FIRMWARE												
	142	...	**Standard PID**									
	143	...	**Standard PID with error squared**									
			Function 142 (143)	Auto-manual logic bit	FB	...	x_2	Output clamp low	Output clamp high	MV	00000.(r)	User
			Function 201 channel	CV	SP	x_1	x_2	Input span	PMV fallback	e_n	00000.(r)	User
			Function 202 channel	PB	D	x_1	x_2	a	PMV	Z_n	00000.(r)	User
			Function 203 channel	I	Integral enable logic bit	x_1	...	Low clamp integral	High clamp integral	Y_n	00000.(r)	User
	144	...	**Batch preload PID**									
	145	...	**Batch preload PID with error squared**									
			Function 144 (145) channel	Auto-manual logic bit	FB	...	x_2	Output clamp low	Output clamp high	MV	00000.(r)	User
			Function 201 channel	CV	SP	x_1	x_2	Input span	PMV fallback	e_n	00000.(r)	User
			Function 202 channel	PB	D	x_1	x_2	a	PMV	Z_n	00000.(r)	User
			Function 203 channel	I	...	x_1	...	...	...	Y_n	00000.(r)	User
			Function 204 channel	Low preload limit	High preload limit	x_1	x_2	Local low preload value	Local high preload value	W_n	00000.(r)	User

a = Derivative filter
CV = Controlled variable
D = Rate gain
e_n = Loop error

FB = Reset feedback
I = Reset time
MR = Manual Reset
MV = Manipulated variable
PB = Proportional Band

PMV = Preclamp manipulated variable
SP = Setpoint
W_n = Integral (lag) input
Y_n = Integral (lag) output
Z_n = Derivative

Category	Code	System Input	Description	Source 1	Source 2	Input 1	Input 2	Output 1	Output 2	Output Data Type	Default Decimal Location	Units
CONTROL FIRMWARE												
	146	...	**Cascade PID**									
	147	...	**Cascade PID with error squared**									
			Function 146 (147) channel	Cascade-local logic bit	FB	...	x_2	Output clamp low	Output clamp high	MV	00000.(r)	User
			Function 201 channel	CV	SP1	x_1	x_2	Input span	PMV fallback	e_n	00000.(r)	User
			Function 202 channel	PB	D	x_1	x_2	a	PMV	Z_n	00000.(r)	User
			Function 203 channel	I	SP2	x_1	x_2	Low clamp integral input	High clamp integral input	Y_n	00000.(r)	User
				a = Derivative filter CV = Controlled variable e_n = Loop error D = Rate gain FB = Reset feedback I = Reset time MR = Manual reset		MV = Manipulated variable PB = Proportional band PMV = Preclamp manipulated variable SP = Setpoint Y_n = Integral (lag) output Z_n = Derivative						
	+148	...	**Track or hold**									
			Function 148 channel	(Extended)	(Logical)*	x_1	...	Delta	...	Extended	00000.(r)	User
			Function 201 channel	(Logical) Manual reqst logic bit	(Logical) Auto-reqst logic bit	...	...	Output clamp low	Output clamp high	Extended	00000.(r)	User

+ This function cannot be assigned to CALC channel addresses 001-099.

Category	Code	System Input	Description	Source 1	Source 2	Input 1	Input 2	Output 1	Output 2	Output Data	Default Decimal	Units
CONTROL FIRMWARE												
	+149	...	**Hold or Track**									
		Function 149 channel		(Extended)	(Logical)*	x_1	...	Delta	...	Extended	00000.(r)	User
		Function 201 channel		(Logical) Manual reqst logic bit	...	...	...	Output clamp low	Output clamp high	Extended	00000.(r)	User
	+150	...	**Sequencer**									
			Function 150 channel	(Logical) Load logic bit	(Extended)** Load value	...	x_2	Min step	Max step	Displayed	00000.	User
			Function 211 channel	(Extended)** Offset to Source 1 at seqr addr	(Extended)** Offset to Source 2 at seqr addr	Status input offset	Step offset	Relay offset	Msg offset	Displayed	00000.	User
	151-159	Reserved										
APPLICATION FIRMWARE												
	160	...	**Linear weighting**	(Extended)	(Extended)	x_1	x_2	User	User	Extended	00.000(r)	User

Source 1 is the channel address that contains the mol percent of component A.
Source 2 is the channel address that contains the mol percent of component B.
You can extend the operation of Function 160 to as many channels as desired by assigning Function 100's to successively higher channel addresses.

Output 1 is a property of component A.
Output 2 is a property of component B.

* Source 2 is first of two logic addresses used for switch wiring.
** The load value cannot contain a fraction.
+ These functions cannot be assigned to CALC channel addresses 001-099.

Category	Code	System Input	Description	Source 1	Source 2	Input 1	Input 2	Output 1	Output 2	Output Data Type	Default Decimal Location	Units
GAS SPECIFIC VOLUME												
	161	. . .	**Perfect gas**	(Extended) specific volume	(Extended)	x_1	x_2	User	User	Extended	00.000(r)	User
			Source 1 is the channel address that contains the absolute pressure. Source 2 is the channel address that contains the absolute temperature.			Output 1 is a particular gas constant. Output 2 is the scaling factor. The default is 1.						
APPLICATION FIRMWARE												
GAS SPECIFIC VOLUME	162	. . .	**Natural gas specific volume AGA-3**	(Extended)	(Extended)	x_1	x_2	User	User	Extended		User
			Function 162 channel	P	T			P_b	T_b	V	00.000(r)	
			Function 201 channel	G	C_v			G_b	. . .	V/V_b	00000.(r)	
			Function 202 channel	Mol% CO_2	Mol% N_2			Base Mol% CO_2	Base Mol% N_2	F_{pv}	00000.(r)	
			C_v = Conversion factor F_{pv} = Supercompressibilty factor or NX-19 G = Specific gravity G_b = Specific gravity at base conditions P = Pressure in psia			P_b = Base pressure in psia T = Temperature in degrees F T_b = Base temperature in degrees F V = Specific volume V_b = Base specific volume						
	163 and 165	. . .	**Steam specific volume**	(Extended)	(Extended)	x_1	x_2	User	User	Extended	00.000(r)	User
			Use Function 163 with a temperature input in F. Use Function 165 with a temperature input in C. Source 1 is the channel address of the pressure value. Source 2 is the channel address of the temperature.			Output 1 contains the value of one atmosphere in units, consistent with the Source 1 data. Output 2 can convert data from Ft^3/lbm to other units. If undefined, Output 2 defaults to a value of 1.						

Category	Code	System Input	Description	Source 1	Source 2	Input 1	Input 2	Output 1	Output 2	Output Data Type	Default Decimal Location	Units
	164 and 166	. . .	**Enthalpy of steam**	(Extended)	(Extended)	x_1	x_2	User	User	Extended	00000.(R)	User
			Use Function 164 with a temperature input in F. Use Function 166 with a temperature input in C. Source 1 is the channel address of the pressure value. Source 2 is the channel address of the temperature.			Output 1 contains the value of one atmosphere in units, consistent with the Source 1 data. Output 2 can convert data from BTU/lbm to other units. If undefined, Output 2 defaults to a value of 1.						
	167	. . .	**Natural gas specific volume AGA-8**	(Extended)	(Extended)	x_1	x_2	User	User	Displayed		User
			Function 167 channel	P	T	. . .	. . .	P_1	T_1 (0-3)	V	0.000 (r)	
			Function 201 channel	% N_2	% CO_2			KOUT	. . .	Z	0. (r)	
			Function 202 channel	% H_2S	% H_2O	. . .	. . .	. . .	. . .	D	0. (r)	
			Function 203 channel	% Helium	% methane	. . .	. . .	. . .	. . .	d	0. (r)	
			Function 204 channel	% ethane	% propane	. . .	. . .	. . .	. . .	MW	0. (r)	
			Function 205 channel	% n-butane	% i-butane	. . .	. . .	. . .	. . .	sum	0. (r)	
			Function 206 channel	% n-pentane	% i-pentane	. . .	. . .	. . .	. . .	B	0. (r)	
			Function 207 channel	% n-hexane	% n-heptane	. . .	. . .	. . .	. . .	. . .		
			Function 208 channel	% n-octane	% n-nonane	. . .	. . .	. . .	. . .	. . .		
			Function 209 channel	% n-decane	% O_2	. . .	. . .	. . .	. . .	. . .		
			Function 210 channel	% CO	% H_2	. . .	. . .	. . .	. . .	. . .		

B = second viral coefficient
D = mass density
d = molar density in mols/ft^3
KOUT = conversion constant for D and V (cubic ft. per lb.)/KOUT = desired unit)
MW = molecular weight of mixture

P = pressure
P_1 = value of one unit of pressure
sum = total of gas components
T = temperature
T_1 = constant specifying temperature unit
V = specific volume in cubic feet
Z = compressibility factor

168-169 Reserved

Category	Code	System Input	Description	Source 1	Source 2	Input 1 Data Type	Input 2 Decimal Location	Output 1	Output 2	Output	Default	Units
ORIFICE FLOW	170	...	**Simple orifice**	(Extended)	(Extended)	x_1	x_2	User	User	Extended	00000.(r)	User

Source 1 is the channel address that contains the value of the pressure drop across the orifice.
Source 2 is the channel address that contains the value of the specific volume of the fluid.

Output 1 is the constant calculated to give the proper value of flow for a known value of pressure drop.
Output 2 is the scaling factor. Default value is 1.

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ORIFICE FLOW	171	...	**Flange taps upstream**	(Extended)	(Extended)	x_1	x_2	User	User	Extended	See below	User
	172	...	**Flange taps downstream**									
	173	...	**Pipe taps upstream**									
	174	...	**Pipe taps downstream**									

Function Codes 171-174 operate in exactly the same way. Choose the function that is appropriate for the installation site.

Function 17X channel	h_w	V	x_1	x_2	d	D	Q_v	00000.(r)
Function 201 channel	V/V_b	u_i	x_1	x_2	C_o	u_c	Q_b	00000.(r)
Function 202 channel	P	T	x_1	x_2	ALPHA	k	Q_m	00000.(r)

ALPHA = Value of thermal expansion coefficient
C_o = Constant to be used as a units conversion factor or meter proof factor
d = Orifice diameter in inches
D = Inside pipe diameter in inches
h_w = Pressure drop across orifice in inches of water
k = Specific heat ratio of the flowing gas
P = Flowing pressure in psia
Q_b = Volume flow at base conditions
Q_m = Mass flow
Q_v = Volume flow at flowing conditions

T = Flowing temperature in degrees F
u_c = Viscosity multiplier
u_i = Viscosity of the fluid in units which become centipoise when multiplied by u_c. For steam and water applications, leave 000 at Source 2, and enter 1 in Input 2.
V = Specific volume of the fluid at flowing conditions, in Ft/lbm
V/V_b = Ratio of the specific volume of the fluid at flowing conditions to the specific volume of the fluid at base conditions. For natural gas applications, enter the address of the 2nd channel of the natural gas specific volume function (AGA-3). For steam and water applications, leave 000 at Source 1 and enter a constant value of 1 in Input 1.

Category	Code	System Input	Description	Source 1	Source 2	Input 1	Input 2	Output 1 Data Type	Output 2 Decimal Location	Output	Default	Units
	175	...	**Compressor Efficiency**	(Extended)	(Extended)	x_1	x_2	...	...	Extended		User
		Function 175 channel		P_1	% $C0_2$	x_1	x_2	...	...	EFFIC	0000.0(r)	User
		Function 201 channel		T_1	% N_2	x_1	x_2	...	...	WA	00000.(r)	User
		Function 202 channel		P_2	% Methane	x_1	x_2	...	...	M	00000.(r)	User
		Function 203 channel		T_2	% Ethane	x_1	x_2	...	...	D_1	00000.(r)	User
		Function 204 channel		P_b	% Propane	x_1	x_2	...	...	Z_1	00000.(r)	User
		Function 205 channel		T_b	% i-Butane	x_1	x_2	...	...	D_2	00000.(r)	User
		Function 206 channel		VA_b	% n-Butane	x_1	x_2	...	...	Z_2	00000.(r)	User
		Function 207 channel		CP_o	% i-Pentane	x_1	x_2	...	...	D_b	00000.(r)	User
		Function 208 channel		...	% n-Pentane	...	x_2	...	...	Z_b	00000.(r)	User
		Function 209 channel		...	% n-Hexane	...	x_2	...	...	G_b	00000.(r)	User

CP_o = Override value of specific heat at constant pressure, in BTU/lb-mol/R
D_1 = Molal density of inlet state in Ft/lbm-mol
D_2 = Molal density of exit state in Ft/lbm-mol
D_b = Molal density of base state in Ft/lbm-mol
EFFIC = Isentropic compression efficiency
G_b = Specific gravity at base state
M = Molecular weight of mixture in lbm-mol
P_1 = Inlet pressure in psia
P_2 = Exit pressure in psia
P_b = Base pressure in psia

T_1 = Inlet temperature in degrees F
T_2 = Exit temperature in degrees F
T_b = Base temperature in degrees F
VA_b = Specific volume of air at base conditions
WA = Work done on each pound of gas in ft-lbf/lbm
Z_1 = Compressibility factor of inlet state
Z_2 = Compressibility factor of exit state
Z_b = Compressibility factor of base state

Category	Code	System Input	Description	Source 1	Source 2	Input 1	Input 2	Output 1	Output 2	Output Data Type	Default Decimal Location	Units
	176	. . .	**ASME MFC-3M-1985 orifice meter**	(Extended)	(Extended)	x_1	x_2	User	User	Extended	00000.(r)	User
			Function 176 channel	h_w	V	x_1	x_2	d	D	Q_v		
			Function 201 channel	V/V_b	u_i	x_1	x_2	C_o	u_c	Q_b		
			Function 202 channel	P	T	x_1	x_2	A_m	k	Q_m		
			Function 203 channel	T_m		x_1	x_2	A_p	C_t	C_y		

A_m = coefficient of thermal expansion of orifice
A_p = coefficient of thermal expansion of pipe
C_o = constant to be used as a units conversion factor or meter proof factor
C_t = constant specifying orifice type and pressure tap installation (see table below)
C_y = deviation from ideal flow
d = orifice diameter in inches
D = inside pipe diameter in inches
h_w = pressure drop across orifice in inches of water
k = specific heat ratio of the flowing gas
P = flow pressure in psia
Q_b = volume flow at base conditions
Q_m = mass flow
Q_v = volume flow at flowing conditions
T = flowing temperature in F
T_m = temperature in F at which orifice and pipe were measured
u_c = viscosity multiplier
u_i = viscosity of fluid in units which become centipoise when multiplied by u_c. For steam and water applications, leave 000 at Source 2 and enter 1 in Input 2.
V = Specific volume of the fluid at flowing conditions, in Ft^3/lbm
V/V_b = Ratio of the specific volume of the fluid at flowing conditions to the specific volume of the fluid at base conditions. For natural gas applications, enter the address of the 2nd channel of the natural gas specific volume function (AGA-3). For steam and water applications, leave 000 at Source 1 and enter a constant value of 1 in Input 1.

C_t - Installation and Orifice Constant

0 = Incompressible fluid in a flange-tap orifice
1 = Incompressible fluid in a corner-tap orifice
2 = Incompressible fluid in a D and D/2 orifice
3 = Upstream line pressure in a flange-tap orifice
4 = Upstream line pressure in a corner-tap orifice
5 = Upstream line pressure in a D and D/2 tap orifice
6 = Downstream line pressure in a flange-tap orifice
7 = Downstream line pressure in a corner tap orifice
8 = Downstream line pressure in a D and D/2 tap orifice

Category	Code	System Input	Description	Source 1	Source 2	Input 1	Input 2	Output 1	Output 2	Output Data Type	Default Decimal Location	Units
	177	...	**ASME MFC-3M-1985 flow nozzle**	(Extended)	(Extended)	x_1	x_2	User	User	Extended	00000.(r)	User
			Function 176 channel	h_w	V	x_1	x_2	d	D	Q_v		
			Function 201 channel	V/V_b	u_i	x_1	x_2	C_o	u_c	Q_b		
			Function 202 channel	P	T	x_1	x_2	A_m	k	Q_m		
			Function 203 channel	T_m		x_1	x_2	A_p	C_t	C_y		

A_m = coefficient of thermal expansion of nozzle
A_p = coefficient of thermal expansion of pipe
C_o = constant to be used as a units conversion factor or meter proof factor
C_t = constant specifying nozzle type and pressure tap installation (see table below)
C_y = deviation from ideal flow
d = nozzle diameter in inches
D = inside pipe diameter in inches
h_w = pressure drop across nozzle in inches of water
k = specific heat ratio of the flowing gas
P = flow pressure in psia
Q_b = volume flow at base conditions
Q_m = mass flow
Q_v = volume flow at flowing conditions
T = flowing temperature in F
T_m = temperature in F at which nozzle and pipe were measured
u_c = viscosity multiplier
u_i = viscosity of fluid in units which become centipoise when multiplied by u_c. For steam and water applications, leave 000 at Source 2 and enter 1 in Input 2.
V = Specific volume of the fluid at flowing conditions, in Ft^3/lbm
V/V_b = Ratio of the specific volume of the fluid at flowing conditions to the specific volume of the fluid at base conditions. For natural gas applications, enter the address of the 2nd channel of the natural gas specific volume function (AGA-3). For steam and water applications, leave 000 at Source 1 and enter a constant value of 1 in Input 1.

C_t - Installation and nozzle Constant

0 = Incompressible fluid in a throat-tap nozzle
1 = Incompressible fluid in a wall-tap nozzle
2 = Upstream line pressure in a throat-tap nozzle
3 = Upstream line pressure in a wall-tap nozzle
4 = Downstream line pressure in a throat-tap nozzle
5 = Downstream line pressure in a wall-tap nozzle

Category	Code	System Input	Description	Source 1	Source 2	Input 1	Input 2	Output 1	Output 2	Output Data Type	Default Decimal Location	Units
	178	. . .	**ASME MFC-3M-1985 venturi meter**	(Extended)	(Extended)	x_1	x_2	User	User	Extended	00000.(r)	User
			Function 176 channel	h_w	V	x_1	x_2	d	D	Q_v		
			Function 201 channel	V/V_b	u_i	x_1	x_2	C_o	u_c	Q_b		
			Function 202 channel	P	T	x_1	x_2	A_m	k	Q_m		
			Function 203 channel	T_m		x_1	x_2	A_p	C_t	C_y		

A_m = coefficient of thermal expansion of venturi
A_p = coefficient of thermal expansion of pipe
C_o = constant to be used as a units conversion factor or meter proof factor
C_t = constant specifying venturi type and pressure tap installation (see table below)
C_y = deviation from ideal flow
d = venturi diameter in inches
D = inside pipe diameter in inches
h_w = pressure drop across venturi in inches of water
k = specific heat ratio of the flowing gas
P = flow pressure in psia
Q_b = volume flow at base conditions
Q_m = mass flow
Q_v = volume flow at flowing conditions
T = flowing temperature in F
T_m = temperature in F at which venturi and pipe were measured
u_c = viscosity multiplier
u_i = viscosity of fluid in units which become centipoise when multiplied by u_c. For steam and water applications, leave 000 at Source 2 and enter 1 in Input 2.
V = Specific volume of the fluid at flowing conditions, in Ft^3/lbm
V/V_b = Ratio of the specific volume of the fluid at flowing conditions to the specific volume of the fluid at base conditions. For natural gas applications, enter the address of the 2nd channel of the natural gas specific volume function (AGA-3). For steam and water applications, leave 000 at Source 1 and enter a constant value of 1 in Input 1.

C_t - Installation and venturi constant

0 = incompressible fluid in a rough cast or fabricated convergent
1 = incompressible fluid in a machined convergent
2 = upstream line pressure in a rough cast or fabricated convergent
3 = upstream line pressure in a machined convergent
4 = downstream line pressure in a rough cast or fabricated convergent

179 Reserved

Category	Code	System Input	Description	Source 1	Source 2	Input 1	Input 2	Output 1	Output 2	Output Data Type	Default Decimal Location	Units
	180 and 181	. . .	**Saturation Pressure of Steam**	(Extended)	. . .	x_1	. . .	User	. . .	Extended	0000.0(r)	User
			Use Function 180 with a temperature input in F. Use Function 181 with a temperature input in C.			Output 1 is the value of one atmosphere in the specified units of pressure.						
		Source 1 is the channel address of the temperature.										
	182 and 183	. . .	**Saturation Temperature of Steam**	(Extended)	. . .	x_1	. . .	User	. . .	Extended	0000.0(r)	User
			Use Function 182 with a temperature input in F. Use Function 183 with a temperature input in C.			Output 1 is the value of one atmosphere in the specified units of pressure.						
		Source 1 is the channel address of the pressure.										
	184 and 185	. . .	**Entropy of Steam**	(Extended)	(Extended)	x_1	x_2	User	User	Extended	0000.0(r)	User
			Use Function 184 with a temperature input in F. Use Function 185 with a temperature input in C.			Output 1 is the value of one atmosphere in the specified units of pressure.						
		Source 1 is the channel address of the pressure. Source 2 is the channel address of the temperature.				Output 2 can be used to convert the output data from BTU/lbm to other units.						
	186 and 187	. . .	**Specific Volume of water**	(Extended)	(Extended)	x_1	x_2	User	User	Extended	0000.0(r)	User
			Use Function 186 with a temperature input in F. Use Function 187 with a temperature input in C.			Output 1 is the value of one atmosphere in the specified units of pressure.						
		Source 1 is the channel address of the pressure. Source 2 is the channel address of the temperature.				Output 2 can be used to convert the output data from Ft^3/lbm to other units.						

Category	Code	System Input	Description	Source 1	Source 2	Input 1	Input 2	Output 1	Output 2	Output Data Type	Default Decimal Location	Units
	188 and 189	...	**Enthalpy of water**	(Extended)	(Extended)	x_1	x_2	User	User	Extended	0000.0(r)	User

Use Function 188 with a temperature input in F.
Use Function 189 with a temperature input in C.
Source 1 is the channel address of the pressure.
Source 2 is the channel address of the temperature.

Output 1 is the value of one atmosphere in the specified units of pressure.
Output 2 can be used to convert the output data from BTU/lbm to other units.

	190 and 191	...	**Entropy of water**	(Extended)	(Extended)	x_1	x_2	User	User	Extended	0000.0(r)	User

Use Function 190 with a temperature input in F.
Use Function 191 with a temperature input in C.
Source 1 is the channel address of the pressure.
Source 2 is the channel address of the temperature.

Output 1 is the value of one atmosphere in the specified units of pressure.
Output 2 can be used to convert the output data from BTU/lbm to other units.

	192 and 193	...	**Turbine efficiency**									
			Function 192/193	P_1	T_1	x_1	x_2	PA	...	EFF	000.00(r)	User
			Function 201	P_2	T_2	x_1	x_2	...	...	H_{s2}	00000.(r)	User

Use Function 192 with a temperature input in F.
Use Function 193 with a temperature input in C.

EFF = isentropic efficiency
H_{s2} = isentropic exhaust enthalpy
P_1 = inlet pressure
P_2 = exhaust pressure

PA = value of 1 atmosphere in the specified units of pressure
T1 = inlet temperature
T_2 = exhaust temperature

Category	Code	System Input	Description	Source 1	Source 2	Input 1	Input 2	Output 1	Output 2	Output Data Type	Default Decimal Location	Units
	194 and 195	...	**Turbine exhaust**									
			Use Function 194 with a temperature input in F. Use Function 195 with a temperature input in C.									
			Function 194/195	P_1	T_1	x_1	x_2	PA	...	X_2	000.00(r)	User
			Function 201	P_2	EFF	x_1	x_2	...	...	H_2	00000.(r)	User

EFF = isentropic efficiency

H_2 = exhaust state enthalpy

P_1 = inlet pressure

P_2 = exhaust pressure

PA = value of 1 atmosphere in the specified units of pressure

T_1 = inlet temperature

T_2 = exhaust temperature

X_2 = exhaust state quality

196-198 Reserved

OF BYTES IN TEXT OUTPUT BUFFER/ZERO OFFSET

199 This function serves two distinct purposes: displays # of bytes in text output buffer, and is used for calibration/diagnostics.

...	**Displays number of bytes**	000	000	...	...	...	...	Displayed	00000	...
...	**Displays zero offset** (See description of function in Digi 4 Plus Systems Manual)									

Category	Code	System Input	Description	Source 1	Source 2	Input 1	Input 2	Output 1	Output 2	Output Data Type	Default Decimal Location	Units
AUTOMATIC DATA STORAGE												
	201-209		Automatically reserves channels to store and display output data for the control, specific volume of natural gas, orifice flow, and/or compressor efficiency functions.	(Extended)	(Extended)	. . .	. . .	User	User	Extended	00000.(r)	User
						See the individual function descriptions for the specific definition of Output 1 and Output 2.						
	211		Automatically reserves channels to store and display output data and/or sequencer functions.	(Extended)	(Extended)	User	User	User	User	Displayed	*	User
						See the descriptions of the meter and sequencer functions for specific definitions of Input 1, Input 2, Output 1 and Output 2.						

* 0.0000 for meter function and 00000 for sequencer function.

SOURCES

A source is a three-digit address that specifies the location of channel input data. (Prefix historical buffer and constant addresses with a "0" and system timer addresses with a "9" when they are sources.)

Channel input data can be numerical or logical. Numerical data comes from system input, channels or CALC channels, global system parameters, historical buffers, and constants; logical data comes from a logic address such as a channel or system timer.

Each channel or CALC channel has two sources: Source 1 and Source 2. The function code determines the number and type of sources assigned.

To assign Source 1:

- Key in the channel address.
- Press the SOURCE key. (If the lower display contains three dashes, the function code does not use Source 1.)
- Key in Source 1.
- Press the ENTER key.

To assign Source 2:

- Press the SOURCE key a second time. (If the lower display contains three dashes, the function code does not use Source 2.)
- Key in Source 2.
- Press the ENTER key.

See Section 6 of the Digi 4 Plus Monitor/Control System User's Manual for detailed information on sources.

Table 2 lists the addresses and briefly describes numerical and logical sources.

Table 2. Sources

Numerical Data		Logical Data	
Address	**Description**	**Address**	**Description**
000	System input (implied source)	000	Always TRUE logic bit
001-099	CALC channels	001-048	Relay logic bits
101-816	Channels	049	Odd master relay logic bit
901-916	Global system parameters	050	Even master relay logic bit
901	Compensator voltage for Scanner #1	051-082	Status input logic bits
902	Compensator voltage for Scanner #2	083	Analog scan logic bit
903	Compensator voltage for Scanner #3	084	Power-on logic bit
904	Compensator voltage for Scanner #4	085-088	Set by terminal/computer
905	Compensator voltage for Scanner #5	090	Program altered/cassette load
906	Compensator voltage for Scanner #6	091	LOG key/operator panel
907	Compensator voltage for Scanner #7	092	Command 110 from computer
908	Compensator voltage for Scanner #8	093	OR of 091 and 092
909	Reserved	094	ALARM LOG/operator panel
910	Time of math scan (0.00 sec.)	095	Command 111 from computer
911	Time of analog scan (0.00 sec.)	096	OR of 094 and 095
912	Real time clock (HHMM.S)	097	Printer needs service
913	Day of the week (1-7)	098	Printer off-line
914	Month and day (MM.DD)	099	Always FALSE logic bit
915	Time duration of last power-off (min.)	101-816	Channel logic bits
916	Running time since last initialized (hrs.)	901-916	System timer logic bits
Use only with historical buffer functions:			
001-016	Historical buffers		
001-032	Number of historical buffer samples		
Use only with multi-segment and polynomial functions:			
001-099	Constants		

LIMITS AND LIMIT OP-CODES

A limit is a five-digit number that sets a bound against which Digi 4 Plus compares channel output data. (CALC channels do not use limits.) If you change the function or decimal code, the Digi 4 Plus nulls limits.

Each channel has two independently assignable limits: Limit 1 and Limit 2. Limit 1 can be high, low, or rate-of-change; Limit 2 can be high or low. The Digi 4 Plus automatically places the decimal in the position specified by the decimal code.

To assign Limit 1:
- Key in the channel address.
- Press the LIMIT key.
- Press the LIMIT TYPE key until the alpha-numeric display contains the letter that represents the desired type (H = high, L = low, C = rate-of-change).
- Key in the limit value.
- Press the ENTER key.

To assign Limit 2:
- Press the LIMIT key a second time.
- Press the LIMIT TYPE key until the alpha-numeric display contains the letter that represents the desired type.
- Key in the limit value.
- Press the ENTER key.

A limit op-code is a six-digit number that specifies the action Digi 4 Plus takes if channel output data goes out of limit, returns within limit, goes into open circuit or over-range, or returns from open circuit or over-range.

If a function code outputs logical data, you cannot set limits, but you can use op-codes. Assign the op-code to Limit 1 to initiate action when the channel logic bit is true. Assign the op-code to Limit 2 to initiate action when the channel logic bit is false.

To assign Limit Op-code 1:
- Press the CHANNEL key.
- Key in the channel address.
- Press the LIMIT and LIMIT OP-CODE keys.
- Key in Limit Op-code 1.
- Press the ENTER key.

To assign Limit Op-code 2:
- Press the LIMIT OP-CODE key a second time.
- Key in limit op-code 2.
- Press the ENTER key.

To assign Limit Op-code 3:
- Press the LIMIT OP-CODE key a third time.
- Key in Limit Op-code 3.
- Press the ENTER key.

See Section 7 of Digi 4 Plus Monitor/Control System User's Manual for details on limits and limit op-codes.

Table 3 lists each op-code and specifies the digits you enter to assign the codes.

Table 3. Limit Op-Codes

	Digit 1	Digit 2	Digit 3	Digit 4	Digit 5	Digit 6
Op-Code 1	Address whose logic bit must also be TRUE for a trip to occur at this channel 000 = always TRUE address			1 = message on LIMIT EXCEEDED 0 = message on LIMIT EXCEEDED or INVALID DATA	1 = double scan trip 0 = single scan trip	HYSTERESIS 0 = 10 counts 1 = 1 count . . 9 = 9 counts
Op-Code 2	ACTION TAKEN WHEN LIMIT EXCEEDED			ACTION TAKEN WHEN DATA INVALID		
	1 = activate RELAY 0 = no action	1 = activate ALARM limit indicators 0 = no action	1 = turn ON channel logic bit 0 = no action	1 = activate RELAY 0 = no action	1 = activate ALARM limit indicators 0 = no action	1 = turn ON channel logic bit 0 = no action
Op-Code 3	LIMIT RELAY ADDRESS 01-48 00 = no relay action		LIMIT MESSAGE ADDRESS 01-99 00 = no message		RETURN MESSAGE ADDRESS 01-99 00 = no message	

CONFIGURATION CODES

A configuration code is a six-digit number that tells the system how to perform certain operations. There are three types of configuration codes:

System Configuration Codes specify the parameters that are basic to the operation of the Digi 4 Plus. These parameters include the content and format of reports, the output device for reports and messages, and user-defined passwords.

Relay Latching Configuration Codes specify the latching relays.

Sequencer Configuration Codes specify the operation of the sequencer function.

You can assign a configuration code only in the program mode.

To assign a configuration code:

- Press the PROGRAM key. If necessary, key in your password.
- Press the ENTER key.
- Press the CONFIG CODE key.
- Key in the address.
- Press the ENTER key.
- Key in the configuration code.
- Press the ENTER key.

See Section 10 of the Digi 4 Plus Monitor/Control System User's Manual for detailed information on configuration codes.

Table 4 lists the category and address of all configuration codes, briefly describes each code, and specifies the digits you enter to assign the codes.

When the digit controls a single feature, assign a 1 to enable the feature, or assign a 0 to disable it.

- The symbol "#" indicates you must enter a number.
- The numbers "+1", "+2", and "+4" indicate a digit controls multiple features. To determine the digit's value, select the features you want, total the numbers for the features, and assign the total to the digit.
- Parentheses indicate a non-zero default.

Table 4. Configuration Codes

INPUT/OUTPUT and SECURITY

Addr.	Description	Digit 1	Digit 2	Digit 3	Digit 4	Digit 5	Digit 6
001	Scanner mapping	Bank 1 to row # (1)	Bank 2 to row #	Bank 3 to row #	Bank 4 to row #	Bank 5 to row #	Bank 6 to row #
002	Scanner mapping	Bank 7 to row #	Bank 8 to row #	10 second synchronize	. . .	. . .	
003	Peripheral ports	Row # to Peripheral Port 1 (PP1)	Baud rate Peripheral Port 2 (PP2) 1=1200 0=2400	Row to PP2 100 +1 200 +2 300 +4	Row to PP2 400 +1 500 +2 600 +4	Row to PP2 700 +1 800 +2	Block # added to PP2
004	Printer port	# lines per page (48)		Baud rate*	72 character list program	Kaye printer not used	. . .
005	Communications port	# lines per page		. . .	72 character list program	Answer-back message TRM +1	Kaye software interface (1)
006	European format	Day/month	Comma after units digit	. . .	. . .	. . .	. . .
007	Master relays	Operation of master relays	Operation of master relays	Master relays normally energized	. . .	. . .	. . .
008	Reserved	. . .	. . .	. . .	. . .	. . .	. . .
009	Security	Program mode password required	Secure Alarm Log +1 Auto Log +2 Timers +4	Secure Sources +1 Inputs +2 Outputs +4	Secure Units +1 Limits +2 Text +4	Secure Constants +1 Hist.buffer +2	. . .

* 1=110, 2=150, 3=300, 4=600, 5=1200, 6=2400, 7=4800, 0=2400.

DATA REPORTS

Addr.	Description	Digit 1	Digit 2	Digit 3	Digit 4	Digit 5	Digit 6
0n0*	Generates report	Logic address AUTO LOG active			Logic address (091)**		
0n1*	Releases stored reports	Logic address printer port release			Logic address communications port release		
0n2*	Defines buffering and output device	Maximum # of stored reports		Delete oldest report	Report to printer port (1)**	Report to communications port	. . .
0n3*	Specifies text output controls	Message address of auto-dial phone #		Message address of start-of-text msg		Message address of end-of-text msg	
0n4*	Formats report header	Report type on new page	64 character report header	Address of 1st header message		# of lines in report header	01-16 in report header (1)**
0n5*	Formats report	# of lines in body of report		Address of date/time message		# of channels per line 1...9 0 = 16	# extra spaces between channels
0n6*	Selects data	Ch. addr./label format above +1 include labels +2 incl. ch. addr. +4	Include relay & status input (1)**	Data from row # 100 +1 (1)** 200 +2 300 +4	Data fr. row # 400 +1 500 +2 600 +4	Data from row # 700 +1 800 +2	Trending = 1
0n7*	Selects historical buffer	Hist. buff. 01 +1 02 +2 03 +4	Hist. buff. 04 +1 05 +2 06 +4	Hist. buff. 07 +1 08 +2 09 +4	Hist. buff. 10 +1 11 +2 12 +4	Hist. buff. 13 +1 14 +2 15 +4	Hist. buff. 16 +1

* n = 1, 2, 3, or 4 and corresponds to the respective data report.
** Data Report 1 default

ALARM STATUS REPORT

Addr.	Description	Digit 1	Digit 2	Digit 3	Digit 4	Digit 5	Digit 6
050	Generates alarm status report	Logic address ALARM LOG active			Logic address		
051	Releases stored alarm status reports	Logic address printer port release			Logic address communications port release		
052	Defines buffering and output device	Maximum # of stored alarm status reports		Delete oldest alarm status report	Alarm status report to printer port	Alarm status report to communications port	. . .
053	Specifies text output controls	Message address of auto-dial phone #		Message address of start-of-text msg		Message address of end-of-text msg	
054	Formats header	Alarm status report on new page	64 character report header	Address of 1st header message		# of lines in report header	. . .
055	Formats report	# of lines in body of alarm status report		Address of date/time message		# of channels per line	# extra spaces between channels
056	Selects data	Format channel address/label above data +1 incl. labels +2*	Include relay & status input	. . .	. . .	. . .	. . .

*Channel addresses are automatically included in Alarm Status report.

057 - 059 Reserved

LIMIT AND SEQUENCER MESSAGES

Addr.	Description	Digit 1	Digit 2	Digit 3	Digit 4	Digit 5	Digit 6
060	Reserved	...	...	...	...	...	...
061	Releases stored messages	Logic address printer port release			Logic address communications port release		
062	Defines buffering and output device	Maximum # of stored messages (99)		Delete oldest message	Messages to printer port (1)	Messages to communications port	...
063	Specifies text output controls	Message address of auto-dial phone #		Message address of start-of-text msg		Message address of end-of-text msg	

064 - 069 Reserved

ACCUMULATION TOTALS

Addr.	Description	Digit 1	Digit 2	Digit 3	Digit 4	Digit 5	Digit 6
070	Reserved	...	...	...	...	...	...
071	Releases stored totals	Logic address printer port release			Logic address communications port release		
072	Defines buffering and output device	Maximum # of stored totals		...	...	...	...
073	Specifies text output controls	Message address of auto-dial phone #		Message address of start-of-text msg		Message address of end-of-text msg	

074 - 079 Reserved

MESSAGES AND LABELS

Messages and labels provide a textual description of displayed data. You define each message or label at a text address. Refer to Configuration Codes 061-063 for information on codes that govern the printing and transmission of messages and labels.

To assign a message or label:
- Press the TEXT key.
- Key in the address.
- Press the ENTER key.
- Key in the message or label. (If you use alphabetic as well as numeric characters, remember to use the correct shift mode.)
- Press the ENTER key.

To change a message or label:
- Press the TEXT key.
- Key in the address.
- Press the NULL key.
- Key in the new message or label.
- Press the ENTER key.

Table 5 lists message and text addresses and briefly describes message types.

Table 5. Text Addresses

Message Address	Text Address	Message Type
00	000	32-character (maximum) response message to an access command from the communications port CXT protocol
01-99	001-099	32-character (maximum) limit messages, report headers, sequencer messages, start-of-text and end-of-text messages* and auto-dial telephone numbers
101-816	101-816	8-character (maximum) labels that describe channel output data

* You must enter start-of-text and end-of-text messages in hexadecimal digits that represent ASCII characters.

See Section 8 of the Digi 4 Plus Monitor/Control System User's Manual for detailed information on messages and labels.

REPORTS

Reports provide a record of system output data. The Digi 4 Plus can generate four independent data reports and one alarm status report.

Data Reports Each data report can contain up to 9 lines of user-defined header information, output data from channels 101-816, relay and status input logic states, and historical buffer data. Data from CALC channels cannot be included in a report.

Data Report 1 is pre-configured with the following defaults:
- It is sent to the printer port when you press the LOG key.
- It includes data from Channel Addresses 101-116 and relay and status input logic states.

Alarm Status Reports The alarm status report lists all channels in alarm. It can also include a user-defined header and the relay and status input logic states.

The following configuration code addresses govern reports:

Addresses	Report Controlled
010-017	Data Report 1
020-027	Data Report 2
030-037	Data Report 3
040-047	Data Report 4
050-056	Alarm status report

You also use data reports for trending or to supply the database for Kaye workstation software packages. The following pages show you how to set up a trend report. See the Auto Trend Manual for detailed information on trending. See the documentation supplied with your workstation software for detailed information on data reports with KVIEW, KDIAL or KDAWS.

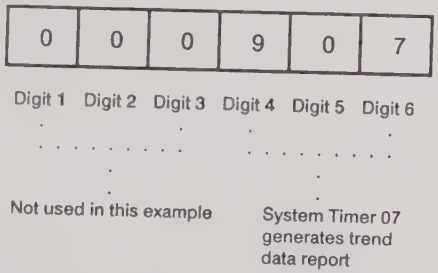
See Section 9 of the Digi 4 Plus Monitor/Control System User's Manual for detailed information on reports.

Auto-Trend This feature lets you graph up to 32 channels (2 rows) of live or historical data. Choose from 3 formats: 6-point graph, 12-point graph, or digital. To set up a trend:
Select one of the standard data reports as the trend report.

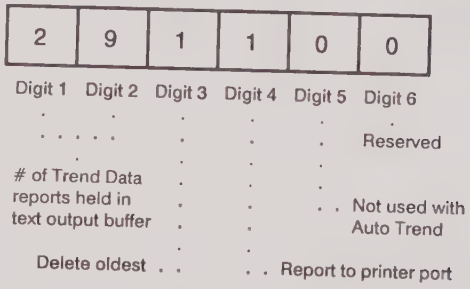
- Set the configuration codes for the report.
- Enter the text messages that define the format, triggers and content of each trend.
- Set a system timer with a 10 (or 20) second reset time.

We use Report 4 and Config. Codes 040-046 in the following example. The timer and text addresses are selected arbitrarily.

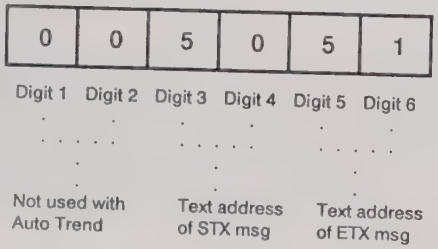
Config. Code 040 selects timer to generate report.



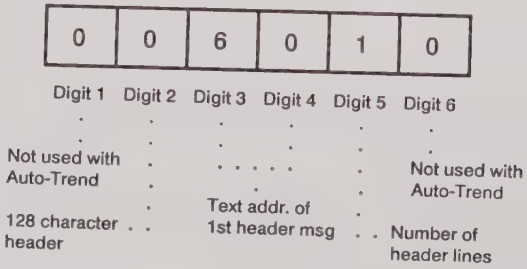
Config. Code 042 sets maximum number of reports, deletes oldest, and sends data to the printer.



Config. Code 043 specifies STX and ETX addresses.



Config. Code 044 specifies address of first header message and selects # of lines in report header. One header line is required for each trend.



Config. Code 045 specifies address of date/time message.

0	0	5	2	0	0
Digit 1	Digit 2	Digit 3	Digit 4	Digit 5	Digit 6

Not used with Auto-Trend

Not used with Auto-Trend

Text addr. of date/time msg

Number of channels per line

Not used with Auto-Trend

Config. Code 046 formats labels, includes relay and status inputs, selects 2 rows of data, enables trending.

3	1	5	0	0	1
Digit 1	Digit 2	Digit 3	Digit 4	Digit 5	Digit 6

Format labels above data

Enable Auto-Trend

Include relay and. status input data

Trend data from rows 700 or 800

Trend data from rows. 100, 200 or 300

Trend data from rows 400, 500 or 600

Now enter the STX, ETX, header and date/time information. Enter 5B24 (STX message) at text address 050. Enter 5D (ETX message) at text address 051. Enter the 1st and 2nd header messages at text addresses 060 and 061. The figure below identifies the parameters of these messages and shows how to set up a 6-pt. trend. Separate each parameter with a slash (/). If you want titles, enter them at addresses 062 and 063.

*/	1/	02/	05/	1/	0.0/	100.0/	01/	02/	...	06/

Graphic Identifier

6th channel to trend

Format Type

2nd channel to trend

Live Trigger

1st channel to trend

Historical Trigger

X-axis Right Margin

Time Stamp Intervals before live trend

X-axis Left Margin

The Graphic Identifier is an asterisk (*). Format Type is 1 (6-point), 2 (12-point), or 3 (digital). Live Trigger can be 00 (always on), relays 01-48, or status inputs 51-82. Historical Trigger can be relays 01-48 or status inputs 51-82. Time Stamp Intervals can be 0-9. Left and Right Margin values have a maximum of 5 digits plus sign and decimal. Relative channel addresses can be 01-32 (1st row = 01-16, 2nd row = 17-32).

Enter the date/time message at text address 052. The figure below indicates the parameters of the date/time message and shows how to set it up.

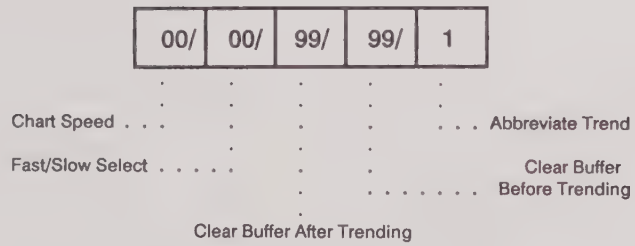


Chart Speed controls the interval for copying trend data from the fast to the slow buffer and the printing of time stamps. (See Table 6 below.) Fast/Slow Select trigger can be 00 (always ON), 99 (always OFF), relays 01-48, or status inputs 51-82. If the trigger is ON, printer trends data from fast buffer. If the trigger is OFF, printer trends data from slow buffer. Clear Buffer After and Clear Buffer Before triggers can be relays 01-48, status inputs 51-82, or 99 if you do not want to clear the print buffer. Abbreviate Trend can be 0 (fill out page with blank grids) or 1 (stop the trend).

Table 6. Chart Speed

	FAST BUFFER				SLOW BUFFER		
Chart Speed	Set Timer	Time Between Samples	Time Stamp	Time/ Page	Copy Sample From Fast to Slow Buffer	Time Stamp	Time/ Page
00	10 seconds	10 seconds	new minute	10 seconds	1 min.	5 mins.	1 hr.
01					2 mins.	10 mins.	2 hrs.
02					4 mins.	20 mins.	4 hrs.
03					6 mins.	30 mins.	6 hrs.
04					8 mins.	40 mins.	8 hrs.
05					12 mins.	60 mins.	12 hrs.
06					16 mins.	80 mins.	16 hrs.
07					24 mins.	120 mins.	24 hrs.
08	20 sec	20 sec	every 2 min	20 sec	2 mins.	10 mins.	2 hrs.
09					4 mins.	20 mins.	4 hrs.
10					8 mins.	40 mins.	8 hrs.
11					12 mins.	60 mins.	12 hrs.
12					16 mins.	80 mins.	16 hrs.
13					24 mins.	120 mins.	24 hrs.

APPENDIX A: DIP SWITCH SETTINGS

DIP switches S2 and S7 govern operation of the communications port. Set the DIP switches with the power off; then power-on so the Digi 4 Plus can read them.

DIP Switch S2 on the Data 4 board specifies communications port protocol and modem support.

Slide 1 specifies communications port protocol.

OFF= CXT protocol (KVIEW , KDAWS or computer)

ON = TRM protocol (KDIAL, auto-dial, terminal, printer or CRT)

Slide 2 specifies modem support.

OFF= no modems

ON = modems

Slides 3 and 4 are usually set OFF. See Section 11 of the Digi 4 Plus Monitor/Control System User's Manual for special applications.

DIP Switch S7 on the Interface I/O panel specifies the communications port baud rate and the unit identifier (UID) of the Digi 4 Plus.

Slides 1-3 specify the baud rate. Table 7 shows the settings.

Table 7. Communications Port Baud Rates

Baud Rate	Slides 1	2	3
110	OFF	OFF	OFF
300	OFF	OFF	ON
600	OFF	ON	OFF
1200	OFF	ON	ON
2400	ON	OFF	OFF
4800	ON	OFF	ON
9600	ON	ON	OFF

Slides 4-8 specify the UID. Each Digi 4 Plus must have a unique UID. KVIEW can use 01 through 32; Mini-KVIEW can use 01 through 08. If you specify 00, you must set Configuration Code Address 902 to 000000. Table 8 shows the settings.

Table 8. Digi 4 Plus Unit Identifiers

Unit Identifier	Slides 4	5	6	7	8	Unit Identifier	Slides 4	5	6	7	8
00	OFF	OFF	OFF	OFF	OFF	16	ON	OFF	OFF	OFF	OFF
01	OFF	OFF	OFF	OFF	ON	17	ON	OFF	OFF	OFF	ON
02	OFF	OFF	OFF	ON	OFF	18	ON	OFF	OFF	ON	OFF
03	OFF	OFF	OFF	ON	ON	19	ON	OFF	OFF	ON	ON
04	OFF	OFF	ON	OFF	OFF	20	ON	OFF	ON	OFF	OFF
05	OFF	OFF	ON	OFF	ON	21	ON	OFF	ON	OFF	ON
06	OFF	OFF	ON	ON	OFF	22	ON	OFF	ON	ON	OFF
07	OFF	OFF	ON	ON	ON	23	ON	OFF	ON	ON	ON
08	OFF	ON	OFF	OFF	OFF	24	ON	ON	OFF	OFF	OFF
09	OFF	ON	OFF	OFF	ON	25	ON	ON	OFF	OFF	ON
10	OFF	ON	OFF	ON	OFF	26	ON	ON	OFF	ON	OFF
11	OFF	ON	OFF	ON	ON	27	ON	ON	OFF	ON	ON
12	OFF	ON	ON	OFF	OFF	28	ON	ON	ON	OFF	OFF
13	OFF	ON	ON	OFF	ON	29	ON	ON	ON	OFF	ON
14	OFF	ON	ON	ON	OFF	30	ON	ON	ON	ON	OFF
15	OFF	ON	ON	ON	ON	31	ON	ON	ON	ON	ON

APPENDIX B: PASSWORDS

Passwords restrict access to the system and prevent accidental changes to Digi 4 Plus parameters. The Digi 4 Plus has two passwords: programming mode and CXT access.

The Programming Mode Password restricts access to the program mode and automatically protects the following parameters: function codes, decimal codes, configuration codes and the system clock. It is stored at Configuration Code Address 901 (Default = 000000). Assign any 6-digit value between 000000 and 999999. Assign a one to Digit 1 of Configuration Code 009 to configure the system to look at the password.

Use Digits 2-5 of Configuration Code 009 to password protect the following parameters:

- Digit 2: Alarm log, auto log and timers
- Digit 3: Sources, inputs and outputs
- Digit 4: Units, limits and text
- Digit 5: Historical buffers and constants

The CXT Access Password restricts access to a Digi 4 Plus when used with a computer. It is stored at Configuration Code Address 902 (Default = 000000). The first two digits contain the unit identifier (UID), specified via Digits 1-3 of DIP Switch S7. The UID determines the last four digits.

With Kaye workstation software, the CXT access password must be 000000. For all other CXT communication, if the UID is 00, assign 00 followed by any 4-digit value between 0000 and 9999. If the UID is 01 through 31, assign the UID followed by 0000.

See Section 10 (Configuration Codes 009, 901 and 902) of the Digi 4 Plus Monitor/Control System User's Manual for detailed information on passwords.

APPENDIX C: SYSTEM DEFAULTS

After you initialize the Digi 4 Plus, it assigns most parameters a default value of zero. However, it assigns certain parameters, such as the function and configuration codes, a non-zero default value so that the system can perform meaningful operations.

The defaults are:

- Analog inputs attached to Bank 1 are automatically sent to Channel Addresses 101-116.
- Channel Addresses 101-116 are assigned the 60mV function (Function Code 001).
- Data Report 1 contains data from Channel Addresses 101-116, a numeric header, and the logic states of the relays and status inputs. Channels are formatted 16 per line.
- Data Report 1 is sent to the printer port when you press the LOG key.
- Limit and sequencer messages are sent to the printer port.
- The printer port defaults to 2400 baud and 48 lines per page.
- Peripheral Port 2 defaults to 2400 baud.
- Master relays are normally de-energized and set for static operation.
- A password is <u>not</u> required to enter the PROGRAM mode.

APPENDIX D: PROGRAM LISTINGS

Program listings are a printed record of programmed information. The Digi 4 Plus can provide listings of channel and/or CALC channel parameters, configuration codes, messages, system timers, historical buffers, constants, and sequencer parameters. To obtain a particular listing, follow the keying sequences below.

To list **all programmed information**:
- Access the program mode.
- Press the CONFIG CODE key.
- Key in 999.
- Press the LIST PROGRAM key.
- Press the ENTER key.

To list **channel parameters 101-816**:
- Press the CHANNEL key.
- Press the LIST PROGRAM key.
- Press the ENTER key.

To list **selected channel and/or CALC channel parameters**:
- Press the CHANNEL key.
- Press the LIST PROGRAM key.
- Key in the number of the first and last addresses.
- Press the ENTER key.

To list **configuration codes**:
- Press the CONFIG CODE key.
- Press the LIST PROGRAM key.
- Press the ENTER key.

To list **messages**:
- Press the TEXT key.
- Press the LIST PROGRAM key.
- Press the ENTER key.

To list **system timers**:
- Press the TIMER key.
- Press the LIST PROGRAM key.
- Press the ENTER key.

To list **historical buffers**:
- Press the BUFFER key.
- Press the LIST PROGRAM key.
- Press the ENTER key.

To list **constants**:
- Press the CONSTANT key.
- Press the LIST PROGRAM key.
- Press the ENTER key.

To list **all sequencer parameters**:
- Press the CONFIG CODE key.
- Key in 200.
- Press the LIST PROGRAM key.
- Press the ENTER key.

To list **selected sequencer parameters**:
- Press the CONFIG CODE key.
- Key in 200.
- Press the LIST PROGRAM key.
- Key in the numbers of the first and last sequencer addresses.
- Press the ENTER key.

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